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Canadian Science Advisory Secretariat (CSAS)

Proceedings Series 2015/063

Pacific Region

Proceedings of the Pacific regional peer review on Recovery Potential Assessment (RPA) for Salish Sucker

March 23, 2015
Vancouver, BC

Chairperson: Sean MacConnachie
Editor: Linnea Flostrand

Fisheries and Oceans Canada
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December 2015

Canada

Foreword

The purpose of these Proceedings is to document the activities and key discussions of the meeting. The Proceedings may include research recommendations, uncertainties, and the rationale for decisions made during the meeting. Proceedings may also document when data, analyses or interpretations were reviewed and rejected on scientific grounds, including the reason(s) for rejection. As such, interpretations and opinions presented in this report individually may be factually incorrect or misleading, but are included to record as faithfully as possible what was considered at the meeting. No statements are to be taken as reflecting the conclusions of the meeting unless they are clearly identified as such. Moreover, further review may result in a change of conclusions where additional information was identified as relevant to the topics being considered, but not available in the timeframe of the meeting. In the rare case when there are formal dissenting views, these are also archived as Annexes to the Proceedings.

Published by:

Fisheries and Oceans Canada
Canadian Science Advisory Secretariat
200 Kent Street
Ottawa ON K1A 0E6

http://www.dfo-mpo.gc.ca/csas-sccs/
csas-sccs@dfo-mpo.gc.ca

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ISSN 1701-1280

Correct citation for this publication:

DFO. 2015. Proceedings of the Pacific regional peer review on Recovery Potential Assessment (RPA) for Salish Sucker; March 23, 2015. DFO Can. Sci. Advis. Sec. Proceed. Ser. 2015/063.

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SUMMARY

These proceedings summarize the relevant discussions and key conclusions that resulted from a Fisheries and Oceans Canada (DFO), Canadian Science Advisory Secretariat (CSAS) Regional Peer Review meeting of March 23rd, 2015 at the Wosk Centre for Dialogue in Vancouver, BC. One working paper was presented for peer review.

In-person participation included Fisheries and Oceans Canada (DFO) Science, Ecosystem Management Branch, and Fisheries Protection program, and external participants from Province of British Columbia and consultants with subject matter expertise.

The conclusions and advice resulting from this review will be provided in the form of a Science Advisory Report to the DFO Species at Risk Program, to provide an assessment of the most current information about Salish Sucker in Canada and the population's potential for recovery.

The Science Advisory Report and the supporting Research Document will be made publicly available on the Canadian Science Advisory Secretariat (CSAS) website.

Compte rendu de l'examen par les pairs de la région du Pacifique sur l'Évaluation du potentiel de rétablissement (ÉPR) du meunier de Salish

SOMMAIRE

Le présent compte rendu résume les discussions pertinentes et les principales conclusions de la réunion régionale d'examen par des pairs du Secrétariat canadien de consultation scientifique (SCCS) de Pêches et Océans Canada (MPO), qui a eu lieu le 23 mars 2015 au Centre for Dialogue à Vancouver, en Colombie-Britannique. Un document de travail a été soumis aux fins d'examen par les pairs à cette occasion.

La réunion en personne comptait des représentants du Secteur des sciences, de la Direction de la gestion des écosystèmes, et du Programme de protection des pêches du MPO, ainsi que des participants externes de la province de la Colombie-Britannique et des experts-conseils en la matière.

Les conclusions et les avis découlant de cet examen seront transmis dans le cadre d'un avis scientifique au programme des espèces en péril du MPO afin de fournir une évaluation des données les plus récentes sur le meunier de Salish au Canada et le potentiel de rétablissement de sa population.

L'avis scientifique et le document de recherche à l'appui seront rendus publics sur le site Web du calendrier des avis scientifiques du Secrétariat canadien de consultation scientifique (SCCS).

INTRODUCTION

A Canadian Science Advisory Secretariat (CSAS) Regional Peer Review was held March 23rd, 2015 at the Wosk Centre for Dialogue (facility of Simon Fraser University) in Vancouver, BC to review one working paper that provided an up to-date recovery potential assessment of Salish Sucker in Canada. The purpose of the review was to assess information on the species' biology, abundance, distribution and life history parameters; habitat and residence requirements; threats and limiting factors to the species' survival; recovery targets and possible scenarios for mitigation of threats and alternatives to human activities; as well as considerations related to allowable harm.

The chair, Sean MacConnachie, welcomed participants and reviewed the role of CSAS in the provision of peer reviewed advice and gave a general overview of the CSAS process. The Chair discussed the role of participants, confidentiality requirements and the expected meeting outputs (Science Advisory Report, Proceedings and Research Document) and their general purposes, as defined by CSAS. He provided background information on COSEWIC and SARA process related to RPAs. Everyone was invited to participate fully in the discussion and contribute knowledge to the process, with the goal of delivering a scientifically defensible product. It was confirmed with participants that all had received copies of the Terms of Reference (Appendix A) and the working paper. The Chair reviewed the agenda with the participants. Linnea Flostrand (DFO Science) was identified as the rapporteur for the meeting.

Two written reviews of the working paper were submitted and distributed prior to the meeting, one by Brian Harvey (Fugu Fisheries Ltd.) and the other by Todd Hatfield (Ecofish Research Ltd), reviews are provided in Appendix E. The goal of soliciting the reviews was to inform, but not limit, discussion by participants attending the review. Copies of the written reviews were made available to participants prior to the meeting. In total 10 people participated in the review meeting (Appendix B).

REVIEW OF THE RECOVERY POTENTIAL FOR THE SALISH SUCKER IN CANADA

Working Paper: Recovery Potential for the Salish Sucker in Canada by Mike Pearson. CSAS Working Paper 2013SAR01

Presenter: Mike Pearson

Formal reviewers: 1. Brian Harvey and 2. Todd Hatfield

Rappoteur: Linnea Flostrand

Working paper accepted with revisions

PRESENTATION OF WORKING PAPER- MIKE PEARSON

The author gave an overview of the paper, touching on status of recovery planning, distribution and abundance, habitat requirements and population dynamics. His talk included information on replacing CPUE based estimates of abundance as presented in the proposed Recovery Strategy (and in Table 7 of working paper), with the use of an alternate method based mainly on watershed scale mark and recapture estimates. Proposed recovery targets were set for each watershed by extrapolating the length of proposed critical habitat in association with MVP estimates from literature searches. The main reasons given for this proposed change were 1) there was a poor correlation between estimated area density and CPUE relationships (i.e. r^2 of ~0.4), and 2) assuming 0.05 adult/m^2 for all deep pool habitats within Proposed Critical Habitat reaches was considered inappropriate, especially since wide slough habitat (>20 m and close to the Fraser River) likely contributes little to population production.

The presentation included photographs depicting habitat threats and damage from: nutrient loading from manure and fertilization applications, lack of riparian habitat, erosion and sediment deposition, riparian habitat infestation of reed canary grass, direct habitat destruction and fragmentation. The presentation also included photographs of activities associated with remediating the effects of hypoxia (increased shading, reducing nutrient loads, and increased water movement).

As a point of clarification, the author described how beaver dams can aid or degrade habitat, depending on circumstances. He thus excluded beaver dams as a threat.

WRITTEN REVIEWS

REVIEWER #1 BRIAN HARVEY

The reviewer restated points outlined in his written review, which offered several revisions, such as:

1) to include more background in section 1.1 of the paper related to explaining why SARA listing changed and what new information is associated with the current RPA,

2) use of references,

3) rewording several sentences to improve clarity or substantiation of points,

4) clarification of methods and conclusions related to selection of applied methods (i.e. describe deficiency in CPUE extrapolation versus the perceived more robust mark and recapture information),

5) English usage.

The reviewer identified the subject of allowable harm as requiring group discussion, particularly the rationale adopted for the proposed levels. He acknowledged there does not appear to be enough information on vital parameters to evaluate human induced mortality through recovery modeling at this time, making this a difficult question for the RPA to address.

The reviewer suggested that the paper needs more clarification to identify and describe habitat threats versus the drivers of those threats, related to hypoxia etc.

REVIEWER #2 TODD HATFIELD

As outlined in his written review, the reviewer identified several structural and content issues with the paper in terms of responding to or addressing questions (elements) posed in the terms of reference. The reviewer also identified several places where the working paper required additional explanation to improve description and clarity. For example, the reviewer suggested some wording to qualify perceived trends in population and habitat, even if only subjectively. He noted the paper should state that population estimates reported in Table 1 (from mark-recapture methods) represent the mature population of age 1 year and older (>100mm). For the purposes of assessing threats, especially related to looking-forward analyses, the reviewer described how the paper would benefit from clearer characterization of threats, threat sources and mechanisms. He suggested that information in Table 5 of the working paper should be better featured to identify sources and mechanisms of threats, such as presented earlier in the paper and related to threats identified in Table 4. He also suggested that the paper would benefit from some explicit ordering or ranking of relative importance/severity of threat sources presented in Table 4. The reviewer commented that the allowable harm estimates proposed as advice (Table 10) require a stronger rationale, and wondered if a quantitative method could be identified for determination of allowable harm. The topic of allowable harm was deferred to group discussion.

DISCUSSION

The author acknowledged and thanked the reviewers for identifying issues and suggesting revisions, which the author generally agreed were valid points.

ESTIMATING POPULATION ABUNDANCE AND RECOVERY TARGETS

The group agreed that the paper needs more explanation for why an alternative method for calculating recovery target was used (compared to estimates from Recovery Strategy). The paper should also describe or discuss how there are different uncertainties between the methods. It was noted that revisions should clearly differentiate sources and interpretation of new recovery targets versus 2009 Recovery Strategy estimates (Table 7 headers, caption or footnote etc). Some individuals advocated that stream length is a better metric than stream area to use in extrapolations for estimating abundance or recovery targets (deep pool area and habitat quality varies too much with water levels etc). The group generally agreed and endorsed that principle. The group recognized the importance of estimating recovery targets by watershed, since each population is independent. There was concern that using the length of critical habitat to estimate recovery targets reflects a somewhat circular reasoning which may discredit estimates. The theoretical approach is that critical habitat should be identified to support the recovery target, not the other way round. However, given the limitations in available habitat it was agreed that the proposed approach was appropriate.

An estimate of habitat capacity (in terms of fish density) is needed to set recovery targets. Alternative ways to estimate habitat capacity using data from actual estimates obtained from mark-recapture data were discussed. These included using the upper and lower bounds or medians of density estimates to calculate habitat carrying capacity for comparison with MVP literature values. **The group agreed that there was value in consideration and developing other approaches for comparison, and a technical subcommittee was struck to develop alternative methods and estimates for validation purposes.**

ESTIMATING ALLOWABLE HARM

A definition of allowable harm was requested, including whether a reduction in habitat quality (and capacity) is part of the definition. It was stated that for this meeting and the RPA process it is intended to refer to direct human induced mortality versus mortality from habitat threats, although it was recognized that the two are not mutually exclusive. Because habitat damage affects vital rates (growth, fecundity, recruitment etc) an argument was made that it may be better to be risk averse (i.e. to have conservative allowable harm levels).

The group recognized the challenge in identifying allowable harm estimates given the lack of information that relates to this subject. In the RPA it can be justified that proposed estimates are meant to be conservative (lower confidence limit) and that in light of information gaps on biological parameters related to recovery, any provisional allowable harm estimates resulting from expert opinion will have high degrees of uncertainty.

It was asked whether allowable harm estimates should have ranges to reflect uncertainty or provide options; why not include both 2% and 4% of abundance estimates? Although there was no consensus on this, it was stated that a range may provide managers with more flexibility to make decisions within a watershed. It was agreed that allowable harm estimates apply to each watershed and should not be transferred between watersheds. **Ultimately, participants recommended that it is not necessary to add an upper range limit based on the somewhat arbitrary "2% of adult population".**

The group discussed how other recovery modeling and MVP studies may be able to inform on Salish Sucker allowable harm. Cases where the species or population has similar life history

traits to Salish Sucker and where habitat quality, not quantify, was limiting would be of particular relevance. **There was consensus that a literature search is required to try to locate information that might inform on improving ways to estimate allowable harm, or at least be used as a discussion point in the revised RPA.**

There was consensus that future work should be directed to model habitat changes and Salish Sucker population responses to those changes.

ADDITIONAL REVISION SUGGESTIONS

1) More detailed descriptions of methods (such as the use of formulae and notation for describing how abundance and recovery targets were estimated) and what results represent.

2) Replace the word "toxic" with another description (such as harmful or deleterious substance), since toxic has a specific Environment Canada definition.

3) Document needs to clarify threats, threat sources and mechanisms. An example to help do this was to have a column added to Table 4 that lists examples of actual threat sources to link to main threat type. It was pointed out that prioritization of habitat threats is required by species DU, not by watershed; Tables 4 and 5 related to entire DU are based on expert opinion that does use quantitative information such as information summarized in pie diagrams (Figures 3 and 4 and Appendix 1 Figure 5, etc).

4) The revised paper should include some photographs of sources and types of habitat threats.

5) Pathway of effect diagram from Recovery Strategy can be added to revise RPA to help substantiate how human induced activities contribute to a threat (such as hypoxia).

6) The proposed critical habitat watersheds and their related information should be listed in a consistent order in the different tables to facilitate cross referencing.

7) Report should emphasize why watershed independence makes it important to describe and consider each watershed for this population rather than the population as a whole (to relate to targets, allowable harm etc).

A draft Science Advisory Report (SAR) was presented and the group identified some conclusions and recommendations to include in the SAR, which are listed below:

CONCLUSIONS & RECOMMENDATIONS

- Severe hypoxia in summer habitats is believed to limit recovery of all populations and to threaten survival in some watersheds. It is considered the predominant threat.
- Based on an alternative method for estimating recovery targets by watershed, most population targets derived in the current RPA are lower than those reported in the proposed Recovery Strategy. Using the more current estimation method, the total proposed population target is 31,500 adult fish.
- Population survival and recovery depends upon halting and reversing degradation of Salish Sucker habitat, particularly the alleviation of severe hypoxia in otherwise suitable habitat.
- There is a need to continue population monitoring and exploratory surveys to determine population size and seasonal distribution.

- Better information is required to characterize life history parameters, for which there are no direct estimates. Reliable parameter estimates (recruitment, fecundity, survival, etc.) would be applicable to population and recovery modelling, which could also be used to consider impacts on habitat quality, quantity and fragmentation.
- Proposed Allowable Harm by watershed is two adult fish or two percent of the lower 95% confidence limit of the most recent population estimate, whichever is greater, to a maximum of 10 adult fish per watershed.
- Information on habitat and land use trajectories is needed to infer future population recovery. Given that more habitat is being lost then gained every year, future work should be directed to model habitat changes and Salish Sucker population responses to those changes.

ACKNOWLEDGEMENTS

The Chair thanks the reviewers for their expertise in reviewing the working paper, and all of the participants for their constructive engagement in the science review process at this meeting. Linnea Flostrand is thanked for being a rapporteur. Lesley MacDougall's and Ann Mariscak's assistance in providing CSAS meeting support is greatly appreciated.

APPENDIX A: TERMS OF REFERENCE

Recovery Potential Assessment (RPA) for Salish Sucker

Regional Peer Review Meeting – Pacific Region

March 23, 2015, Vancouver, BC
Chairperson: Sean MacConnachie

Context

After the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assesses an aquatic species as Threatened, Endangered or Extirpated, Fisheries and Oceans Canada (DFO) undertakes a number of actions required to support implementation of the *Species at Risk Act* (SARA). Many of these actions require scientific information on the current status of the wildlife species, threats to its survival and recovery, and the feasibility of recovery. Formulation of this scientific advice has typically been developed through a Recovery Potential Assessment (RPA) that is conducted shortly after the COSEWIC assessment. This timing allows for consideration of peer-reviewed scientific analyses into SARA processes including recovery planning.

The Salish Sucker (*Catostomus sp.*) is a freshwater fish listed as endangered under the *Species at Risk Act* (SARA) and the identification of its critical habitat is the responsibility of Fisheries and Oceans Canada (DFO). Salish Sucker was re-assessed as Threatened in 2012 (COSEWIC 2012). A draft recovery strategy for this species has been developed and a RPA was previously conducted in 2009 (Harvey 2009).

In support of listing recommendations for Salish Sucker by the Minister, DFO Science has been asked to undertake an RPA, based on the national RPA Guidance. The advice in the RPA may be used to inform both scientific and socio-economic aspects of the listing decision, development of a recovery strategy and action plan, and to support decision making with regards to the issuance of permits or agreements, and the formulation of exemptions and related conditions, as per sections 73, 74, 75, 77, 78 and 83(4) of SARA. The advice in the RPA may also be used to prepare for the reporting requirements of SARA s.55. The advice generated via this process will update and/or consolidate any existing advice regarding this Salish Sucker.

Objectives

To provide up-to-date information, and associated uncertainties, to address the following elements:

Biology, Abundance, Distribution and Life History Parameters

Element 1: Summarize the biology of Salish Sucker.

Element 2: Evaluate the recent species trajectory for abundance, distribution and number of populations.

Element 3: Estimate the current or recent life-history parameters for Salish Sucker.

Habitat and Residence Requirements

Element 4: Describe the habitat properties that Salish Sucker needs for successful completion of all life-history stages. Describe the function(s), feature(s), and attribute(s) of the habitat, and quantify by how much the biological function(s) that specific habitat feature(s) provides varies with the state or amount of habitat, including carrying capacity limits, if any.

Element 5: Provide information on the spatial extent of the areas in Salish Sucker's distribution that are likely to have these habitat properties.

Element 6: Quantify the presence and extent of spatial configuration constraints, if any, such as connectivity, barriers to access, etc.

Element 7: Evaluate to what extent the concept of residence applies to the species, and if so, describe the species' residence.

Threats and Limiting Factors to the Survival and Recovery of Salish Sucker

Element 8: Assess and prioritize the threats to the survival and recovery of the Salish Sucker.

Element 9: Identify the activities most likely to threaten (i.e., damage or destroy) the habitat properties identified in elements 4-5 and provide information on the extent and consequences of these activities.

Element 10: Assess any natural factors that will limit the survival and recovery of the Salish Sucker.

Element 11: Discuss the potential ecological impacts of the threats identified in element 8 to the target species and other co-occurring species. List the possible benefits and disadvantages to the target species and other co-occurring species that may occur if the threats are abated. Identify existing monitoring efforts for the target species and other co-occurring species associated with each of the threats, and identify any knowledge gaps.

Recovery Targets

Element 12: Propose candidate abundance and distribution target(s) for recovery.

Element 13: Project expected population trajectories over a scientifically reasonable time frame (minimum of 10 years), and trajectories over time to the potential recovery target(s), given current Salish Sucker population dynamics parameters.

Element 14: Provide advice on the degree to which supply of suitable habitat meets the demands of the species both at present and when the species reaches the potential recovery target(s) identified in element 12.

Element 15: Assess the probability that the potential recovery target(s) can be achieved under current rates of population dynamics parameters, and how that probability would vary with different mortality (especially lower) and productivity (especially higher) parameters.

Scenarios for Mitigation of Threats and Alternatives to Activities

Element 16: Develop an inventory of feasible mitigation measures and reasonable alternatives to the activities that are threats to the species and its habitat (as identified in elements 8 and 10).

Element 17: Develop an inventory of activities that could increase the productivity or survivorship parameters (as identified in elements 3 and 15).

Element 18: If current habitat supply may be insufficient to achieve recovery targets (see element 14), provide advice on the feasibility of restoring the habitat to higher values. Advice must be provided in the context of all available options for achieving abundance and distribution targets.

Element 19: Estimate the reduction in mortality rate expected by each of the mitigation measures or alternatives in element 16 and the increase in productivity or survivorship associated with each measure in element 17.

Element 20: Project expected population trajectory (and uncertainties) over a scientifically reasonable time frame and to the time of reaching recovery targets, given mortality rates and productivities associated with the specific measures identified for exploration in element 19. Include those that provide as high a probability of survivorship and recovery as possible for biologically realistic parameter values.

Element 21: Recommend parameter values for population productivity and starting mortality rates and, where necessary, specialized features of population models that would be required to allow exploration of additional scenarios as part of the assessment of economic, social, and cultural impacts in support of the listing process.

Allowable Harm Assessment

Element 22: Evaluate maximum human-induced mortality and habitat destruction that the species can sustain without jeopardizing its survival or recovery.

Expected Publications

- CSAS Science Advisory Report
- CSAS Proceedings
- CSAS Research Document(s)

Participants

- Fisheries and Oceans Canada (Science, Fisheries Protection and Ecosystems Management Branches)
- Province and municipal representatives.
- Academia
- First Nations

References

COSEWIC. 2012. COSEWIC assessment and status report on the Salish Sucker *Catostomus* sp. cf. *catostomus* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xi + 36 pp. (Accessed 7 October, 2015)

Harvey, B. 2009. Scientific information in support of a Recovery Potential Assessment for the salish sucker (Catostomus sp.) in Canada. DFO Can. Sci. Advis. Sec. Res. Doc. 2009/067. viii + 16 p.

APPENDIX B: PARTICIPANTS

Last Name	First Name	Affiliation
Brown	Tom	DFO - Science
Flostrand	Linnea	DFO - Science
Gerick	Aly	DFO- Ecosytem Management Branch
Harvey	Brian	Consultant
Hatfield	Todd	Ecofish Research
MacConnachie	Sean	DFO- Science
MacDougall	Lesley	DFO - Centre for Science Advice Pacific
Nantel	Martin	DFO - Ecosytem Management Branch
Pearson	Mike	Consultant
Rosenfeld	Jordan	Province of BC

APPENDIX C: AGENDA

Canadian Science Advisory Secretariat

Centre for Science Advice Pacific

Regional Peer Review (RPR) Meeting

Recovery Potential Assessment of Salish Sucker in Canada

March 23, 2015

Wosk Centre for Dialogue, 580 West Hastings, Vancouver, BC
Chairperson: Sean MacConnachie
Rapporteur: Linnea Flostrand

DAY 1 - Monday, March 25

Time	Subject	Presenter
0900	Welcome, Introductions, Review Agenda & Housekeeping, CSAS Overview & Meeting Procedures	Sean MacConnachie
0930	Presentation of Working Paper	Mike Pearson
1000	Reviewer Presentation & Author Response	Todd Hatfield and Brian Harvey
1100	***Break***	
1120	Group Discussion to review working paper	RPR Participants
1230	***Lunch Break***	
1330	Group Discussion to review working paper	RPR Participants
1530	***Break***	
1545	Compilation of advice and revision of SAR	RPR Participants
1700	***Adjournment***	

APPENDIX D: SUMMARY OF THE WORKING PAPER

Little data is available on the natural history, abundance, population trends, and habitat use of the Salish sucker. Consequently there are many uncertainties in this RPA. Salish suckers are documented from 11 watersheds in Canada and six in Washington State. No known populations have been extirpated, but significant reductions in occupied area within many of the watersheds is documented. Insufficient information exists to estimate minimum viable population size, but Salish suckers life history traits are associated with rapid population growth, resilience to environmental disturbance, and the ability to rapidly (re)colonize habitat. Seasonal hypoxia is the leading threat, affecting up to two-thirds of the more than 180 km of proposed critical habitat in hot dry summers. Habitat destruction, seasonal dewatering, and toxicity are also considered significant threats. Sediment deposition, habitat fragmentation, and introduced predators may be significant but their impacts are poorly understood. Target population sizes vary from 1500 to 5000 adults in the 11 known populations. Estimates of current abundance exist for all or part of seven populations and are far below target populations in all cases. Achieving targets is feasible if the extent of severe hypoxia in proposed critical habitat is reduced.

APPENDIX E: WRITTEN REVIEWS

Recovery Potential Assessment for the Salish Sucker In Canada

Working Paper 2013SAR001 Pacific Region
By Mike Pearson

Review by Brian Harvey
March 2015

This is an excellent, comprehensive RPA written by an authority on the species and its situation. I have provided a "Technical Review" below. I also have some observations to make concerning ambiguities that are the result of English usage. These kinds of ambiguity are easy to create in technical documents where sentences can get packed with a lot of information, and in some cases can leave the wrong message. There are also inconsistencies in the draft – spelling, capitalization, grammar. Because usage issues don't require discussion, I have grouped all such observations after the technical part of the review.

Technical review

Question 1: Is the purpose of the working paper clearly stated?

I think you need more here. Specifically, Section 1.1 (History of Status and Recovery Planning) glosses over a fairly lengthy history that includes two RPAs (the present one being the second), two Recovery Strategies, and a change in listing. A decision maker trying to get up to speed on Salish Sucker is not going to find a coherent story here – and there clearly is a story. Why, for example, was the SARA listing changed? What new information was brought to light that necessitates a second RPA? The body of the document does provide some of these answers, but the reader needs a quick, understandable sketch up front, in Section 1.1.

Question 2: Are the data and methods adequate/explained in sufficient detail to evaluate the conclusions?

The most significant deficiency concerns allowable harm. It's clear that a percentage of abundance has been chosen, but I don't see any rationale. Any precedents from similar species? References?

p.1:

"An RPA was conducted in 2009 and a draft Recovery Strategy, including proposed Critical Habitat, was posted on the Species at Risk Act Public Registry in 2012." Both these documents are in the References section and need to be referred to here.

"Adults move most around dawn and dusk". Does this mean adults move more than juveniles? Or that they swim more? Or that they go longer distances? "Move" is ambiguous.

"They are relatively tolerant of low dissolved oxygen levels." Given how important hypoxia is, suggest you include a value here.

p.4:

". . . utilized a catch-per- unit-effort based method now known to be unreliable." Since there was both an RPA and an RS created based on the earlier results using the unreliable method, wouldn't it be useful to add another sentence to say what the deficiency in the method was? Otherwise, the reader just needs to take it on faith that we now have a "better method." The current text almost reads as though CPUE itself is at fault, which I'm sure is not the intention.

More information on technical changes here would make it easier to argue for more research on abundance and distribution (see comments on the Data Gaps table, below).

"They mature earlier, and at smaller body size than any known population of Catostomus catostomus." Is this the same reference (Pearson and Healey) as the following statement? If not, the statement should be referenced.

p.5:

"Salish suckers require suitable aquatic habitat structure, functional riparian areas and minimum water quality levels." Doesn't tell us much; almost a motherhood statement. Better perhaps to start off with the preamble to Table 2 directly.

p. 6:

"There are small additional areas (<6 km total) in Salwein Creek, Hopedale Slough, Chilliwack Delta and Elk Creek that are also under consideration." Could you tell us what "under consideration" means? By whom? When? Based on what?

p. 9:

"Fisheries and Oceans Canada has determined that the 'residence' concept does not apply to the Salish sucker." I don't think you can say this. The RPA writer and the reviewers came to that conclusion, not DFO. This wording makes it sound like a study was done.

p. 11:

"The existing Kinder-Morgan Trans Mountain pipeline and their proposed corridor for a second one cross through or directly upstream of occupied habitat at 12 locations in six watersheds." This seems serious enough to require a reference.

"Permanent or temporary barriers prevent or inhibit fish from accessing usable habitats and/or alter metapopulation dynamics increasing risk of population extirpation." Do both processes increase risk? Or just the second one?

p. 12:

"Animal rights activists have released several thousand farmed Mink (Neovison vison), into Salish sucker watersheds in the past 20 years. Most recently, approximately 200 animals entered the Pepin Creek watershed in October 2013." No references here. Why did they do this? Does "animals" mean mink also?

Section 3.3 "Beaver Activity". Should this be included here? Earlier in the RPA, beaver dams have been downgraded as a threat.

p. 16:

"Aside from the efforts reported here." Worthwhile to re-identify the source at this point.

"Such generic targets can be refined based on knowledge of the species life history and habitat availability (Rosenfeld & Hatfield 2006)." I'm not sure what this means. Does it mean more knowledge is necessary, or that the knowledge is there but hasn't yet been used to refine the targets? (Usage factoid: "species" is used here in the plural sense, which means it should have

an apostrophe at the end).

Question 3: Is advice aligned to the objectives in the TOR?

Element 22 reads "Evaluate maximum human-induced mortality and habitat destruction that the species can sustain without jeopardizing its survival or recovery." However, human-induced mortality is not evaluated in the RPA, it's simply stated (at 2%). On p. 22, the statement is made that "Given the low levels of current populations across the Canadian Range and that habitat integrity is already severely compromised, there is no sustainable level of habitat destruction." This could be clearer. It's not the habitat destruction that's unsustainable. You can go on destroying habitat forever. It's the population that's not sustainable if you continue or increase habitat destruction. So you really mean: further habitat destruction is not allowable.

Elements 14 and 18 concern habitat. Is it possible to go further and recommend specific activities or projects that will address the lack of habitat? Or is this inappropriate in an RPA?

Question 4: Does the advice reflect uncertainty of the data?

In general, yes. Uncertainty hangs over the document, especially concerning abundance and distribution. The problem I have is that it's not clear how the abundance-assessment methods have improved over the previous ones.

Question 5: Are there additional areas of research?

Table 11 summarizes information gaps. The problem I find with this approach is that the table really seems to be stating that abundance and distribution are by far the most critical gaps. Is this a fair conclusion? You don't actually recommend more research to fill these gaps. Can you do so here? Perhaps more text could put this table in context.

Some observations on usage, all taken from the Abstract:

Salish "sucker" vs Salish "suckers"? Or is it "the" Salish sucker? Choose one and stick to it. Likewise are you capitalizing "sucker"? It's not consistent.

"Data" should always be plural.

There needs to be consistent agreement between subject and verb for singulars and plurals. Eg. **No known populations have been extirpated, but significant reductions in occupied area within many of the watersheds is documented.** It has to be "reductions . . . are." There are also ambiguities in this sentence. First, only "known" populations can logically be said to have been extirpated, so better to say "no populations are known to have been extirpated." Further, what does "reduction in occupied area within many watersheds" mean? Does it mean the area of occupation has been reduced? Or that there are fewer fish in the same area? These are important differences, especially in an Abstract (which may be the only thing that some people read).

Salish suckers life history traits. Is "suckers" possessive or plural? I would suggest Salish sucker's, assuming you go with the singular of sucker (noted above).

Achieving targets is feasible if the extent of severe hypoxia in proposed critical habitat is reduced. Could be ambiguous – I assume you mean geographic extent rather than the actual degree of hypoxia? May confuse some readers.

Comments on usage, by page

p.2:

believed, and written – Believed implies written; you don't need both.

Similarly, the Salwein Creek population was believed extirpated at one time (Inglis et al. 1992), but was later confirmed to exist (Pearson, 2004a). – "found to exist" is consistent ("confirmed" would apply if no fish were found).

p 3:

no confirmed C. catostomus records exist more than a few kilometres west of Hope. – This means the records don't exist, not the fish.

p. 7:

Under these conditions a full 45 % of Proposed Critical Habitat may be severely hypoxic (DO <2.5 mg/l). "A full" adds no information.

Toxicity, in the form of PAH's, originating from creosote retaining walls in two ponds of Salwein Creek appear to exclude Salish suckers, and other fish. PAH: it's not a possessive, and should be written out anyway. The entire sentence is unclear grammatically and should be rewritten or split into two sentences.

Approximately 4.5 km of Proposed Critical Habitat in Bertrand Creek dewaters during summer and early fall annually (Figure 3), seasonally excluding Salish suckers. Very unclear sentence.

particularly if when combined. Is it "if" or "when"?

p. 9:

The only populations between which migration is possible are Miami River/Mountain Slough, which are joined in a headwater pond that drains to both, Salmon River and Bertrand Creek, which are connected at high water through a headwater wetland. Check commas – their usage makes sentence confusing. Does the pond drain to Salmon and Bertrand or not?

radio tagged individuals during summer, but significant numbers of elastomer-tagged fish. Be consistent in use of dash.

p. 10:

List of threats: "Toxicity" stands out as being misnamed. All the other threats are fairly specific "things that happen or are done to" the sucker. Toxicity is, in contrast, a characteristic. Perhaps re-name as "toxins"?

Risk of hypoxia varies seasonally and annually where it occurs. Don't need "where it occurs."

p. 11:

Low flows in late summer eliminate habitat, or restrict movements reducing fitness or survival. Comma in the wrong place alters meaning of the sentence.

Mark recapture work suggests that over 300 Salish suckers occupied Howe's Creek in spring of 2012, with most captures occurring in the reach that dewaters Howe's Creek (Jill Miners, UBC, unpub. data). Mark-recapture should be hyphenated. Also, do you mean "the reach that dewaters IN Howe's Creek?

p. 14:

Table 5: "Livestock access" is not an activity. Re-name according to what the livestock actually do? Or what humans do to make livestock a threat?

p. 19:

Quantitative projections of population trajectories cannot be made due to the lack of estimates of population dynamic parameters, particularly fecundity and recruitment rates. A general statement; needs to be qualified, eg. "For Salish Sucker. . ."

Feasible mitigation measures to the activities. Not "mitigate to." It's mitigation of the effects of activities.

p. 21:

Challenges have included overgrowth with invasive plant species, changing water levels due to beaver activity, vandalism, and accidental mowing by municipal maintenance crews. Serial commas make the meaning unclear. It could be taken to mean that vandalism and mowing lead to changing water levels, or that they have other, unstated effects. If it's the former, then you could just replace the first comma with "and".

Recovery Potential Assessment for the Salish Sucker In Canada

Working Paper 2013SAR001 Pacific Region
By Mike Pearson

Review by Todd Hatfield
March 19, 2015

Reference: 1174-03
Fisheries and Oceans Canada
200 – 401 Burrard Street
Vancouver, BC, V6C 3S4

Dear Mr. MacConnachie:

This letter provides my technical review of the working paper "Recovery Potential Assessment for the Salish Sucker in Canada" by Mike Pearson. The working paper is well written and comprehensive, and I am pleased that DFO has had the paper authored by a recognized expert on the species. I provide the following review comments for consideration during revisions. I have structured my review according to the six questions posed by DFO as guidance for reviewers; I have submitted a marked up copy of the working paper with a number of smaller editorial comments not discussed or presented here.

1. **Is the purpose of the working paper clearly stated and aligned to the Terms of Reference for this CSAS Review?**

The purpose of the paper is clearly stated in the introduction of the working paper. However, the structure of the paper does not appear to align fully with the TOR. The TOR has 22 Elements to be addressed by each RPA. Some of the sections in the working paper align with these elements, but it would be easier to match the content of the paper with the individual elements if the structure of the paper explicitly addressed each element. Some of the later elements appear to have been skipped, likely due to difficulties associated with parameterizing a population model. Irrespective of whether it is reasonable to skip some of the elements, it would be easier to see which elements have been explicitly addressed, if the working paper was organized by the 22 elements in the TOR.

2. **Are the data and methods adequate to support the conclusions?**

3. **Are the data and methods explained in sufficient detail to properly evaluate the conclusions?**

Mike Pearson is a recognized expert on the species and I defer to his practical experience and technical expertise on most matters relating to Salish Sucker. I provide the following points for further consideration and discussion during the peer review workshop.

Section 1.3.2 - Can you comment on recent trends in abundance or habitat quantity/quality? You likely know more about this than anyone else, and it would provide good context for discussion in other sections.

Table 1. - Are these estimates of all life stages? The presentation could be more efficient (1 column) if expressed as mean ± CL.

Section 2.4 – Please expand on the residence concept and why it is rejected for this species.

Section 3 – I have a number of questions or comments on the Threats Assessment methods and conclusions. I do not dispute the conclusions per se, but these comments are intended to improve the presentation and allow greater alignment with approaches currently used in species recovery planning.

Notwithstanding the weaknesses inherent in a threats assessment tool like the IUCN threats calculator used by COSEWIC for status assessments for all species[1], the tool provides a standardized approach, allows a distinction between threat source and threat mechanism, and would let you roll up threats into a single rating. A standardized approach would make the results easier to compare with results for other species. Any deficiencies in the standardized approach could be dealt with in the text, or with supplementary information. More broadly, I have difficulty with the lack of differentiation between threat source and threat mechanism[2]. For example, hypoxia is ranked as the greatest threat to the species throughout its range in Canada; however, there are multiple threat sources that would need to be addressed to improve hypoxia conditions for Salish Sucker. Distinguishing between threat source and threat mechanism would allow clearer presentation and discussion of activities proposed to increase productivity or survivorship (Elements 16 and 17).

Table 4. – It is not clear how you have rolled these up to allow a ranking. For example, when I look at the table, hypoxia doesn't look obviously the worst, and other threats that are ranked as low appear as though they should be higher on the order. Definitions of importance and its components would help.

Section 3.1.4 - You seem to be implying something about the Kinder Morgan pipeline effects, but it would be better if it was made explicit. Is the threat related to a potential spill or from construction activities? What is the toxic effect?

Section 3.1.6 – With respect to the effect of released mink, was there an observed or inferred impact to SSU? I suspect many of the released animals didn't last long, but I really don't know.

Table 5. - This is a very useful table, and provides most of a good threats assessment because it includes evaluation of threat source and threat mechanisms. In my opinion it would be better to present this once and refer to it as needed. At present, there are redundant aspects to Sections 3.1 and 3.2

Table 7. – The target from the recovery strategy is distracting and unnecessary as part of the table. Discuss briefly in text and delete from table. I suggest including another column that shows current abundance estimate as % of target.

Section 4.1 – "Targets for remaining watersheds were estimated proportionally using the length of Proposed Critical Habitat to a maximum of 5000 adults, somewhat below the high end of the literature MVP range." I don't understand your method – please expand.

Section 4.1 – note that in the Word version there are two Section 4.1. The following refers Potential for Reaching Recovery Targets. "Quantitative projections of population trajectories cannot be made due to the lack of estimates of population dynamic parameters, particularly fecundity and recruitment rates." Is this really the case? Could you use some surrogate measures to help get some approximate predictions? I suspect that one thing it would show is that it is not population dynamics that is the issue, but rather its habitat. You state this clearly in the text, but there is no quantitative evidence provided to support the statement. Some approximate calculations would also be useful for the allowable harm assessment.

Section 6.1 - The rationale for the approach used in the allowable harm advice is completely lacking. I also think it may not be supportable given some guesses at the population dynamics. I

[1] ICUN Threats Calculator

[2] See Balmford, A., P. Carey, V. Kapos, A. Manica, A.S.L. Rodrigues, J.P.W. Scharlemann, and R.E. Green. 2009. Capturing the many dimensions of threat: comment on Salafsky et al. Conservation Biology 22:897–911.

would like to see more effort put into providing a strong rationale for these recommendations, or even some preliminary calculations to support the recommendations. At present there is insufficient support for the recommendations.

Table 11. - since this type of list has probably been presented elsewhere, it would be useful to compare this list to those in other documents to ensure consistency or to highlight differences.

4. **If the document presents advice to decision-makers, is the advice and/or recommendations aligned to the objectives in Terms of Reference and in a useable form.**

The primary advice to decision makers is provided in Tables 8, 9 and 10. The advice in Tables 8 and 9 is aligned with the TOR and is in a useable form. Advice in Table 10 requires a stronger rationale and, if possible, support through a more quantitative method.

5. **Does the advice reflect the uncertainty in the data, analysis or process?**

The advice in Table 10 is not c early based on data or a quantitative approach, and does not explicitly include consideration of uncertainty. However, it is not clear that a quantitative approach is feasible for Salish Sucker. Regardless, some acknowledgement of uncertainty should be included in the discussion here.

6. **Are there additional areas of research that are needed to improve the quality of or the ability to provide advice and recommendations related to the stated objectives?**

Additional quantitative analysis may improve the recommendations and advice provided in this RPA. The collection of additional life history information could be used to support a population model and quantitative exploration of management scenarios.

I trust you will find the above comments useful when considering revisions to the working paper. Please feel free to contact me to discuss any of the points.

Yours truly,

Ecofish Research Ltd.

Signed

Todd Hatfield, Ph.D., R.P.Bio.

Senior Environmental Scientist/Project Manager